Technique of Boche Air Raids on London

Many Factors Essential in Bomb Dropping and Chance of Intended Hits Is Small

By A. M. JUNGMANN,
Associate Editor of the "Popular Science Monthly."

GERMAN air raids have caused Londoners to build concrete bomb-proof shelters. When warning of an air raid is received Mrs. Londoner calls the children together, whistles for the dog, and taking the phonograph under her arm, marshals the family into the bomb-proof shelter.

Air raids have brought about a condition which mankind has not known since those prehistoric days when animals rushed madly into caves to protect themselves from terrible flying monsters. The pterodactyl, for instance, must have looked to its victims very much as a bombing Boche looks to an Englishman of to-day. Notwithstanding its repulsive appearance, however, the pterodactyl was a mild creature in comparison to a modern airplane carrying upward of a dozen death dealing bombs.

Among the many horrible implements of destruction which this war has developed the bomb is conspicuous. Whether used on land or in the water, its capacity for destruction is enormous in comparison with its size. The chief handicap in its use by aviators is the difficulty of making it hit the target.

British airman dropping a bomb on the Hun.

Increased Accuracy Offset.

The increased accuracy which has been developed by bomb droppers has been offset by the fact that anti-aircraft guns constantly force the raiders to ascend to greater heights. The higher an aviator flies the greater are the possibilities of error in his calculations for hitting his target.

The principal reason why it is far more difficult to score a hit with a bomb thrown from an airplane than with a gun on the earth is that a bomb thrown from a moving airplane will not fall straight down, but will continue to move for a time in the direction of the flying machine. This means that the bomb thrower must calculate just the second he must drop the bomb before he reaches his target. Although practice helps greatly in determining the exact moment at which to let go, aviators do not have to depend solely upon themselves in the matter. Special sighting arrangements have been devised which are of great assistance in making a hit.

The moment a bomb is dropped from a moving airplane it comes under the influence of both the forward movement of the airplane and gravitation. The result is that it follows a curved path from the machine to the earth. The higher the machine is flying and the faster it is going the greater is the distance in front of the target at which the bomb must be released. If a bomb is dropped only one-half a second before it should have been released it will not strike within many yards of the target. It is far more difficult to select a target and drop bombs on it from an airplane than it is from a dirigible.

Wind an Important Factor.

In dropping bombs an aviator must take into account not only gravitation and his own velocity, but also the winds. The wind conditions between the airplane and the earth may vary greatly. This would greatly influence the trajectory or curve of the path of the falling bomb. A decided difference is made in this curve if the bomb is thrown with or against the wind and if the bomb encounters a side wind, which would throw it out of its course.

In order to determine just when to release a bomb an aviator must know at what height he is flying. For this purpose he consults a barometer. But in order that the knowledge which the barometer gives him may be of material benefit in bomb throwing, the aviator must also know at exactly what elevation above sea level his target is. Therefore aviators have to study maps of the country which they intend bombing before starting out on a raid.

Next the aviator must know at what speed he is travelling. This he can determine by ascertaining the time required to cover a certain definite distance. He can calculate this distance by consulting his map. Naturally he must make this calculation while in the immediate vicinity of his target. For example, if he notes that the distance between two given points is 1,000 meters and he covers that distance in twenty-five seconds, he will know that he is travelling at the rate of forty meters per second.

The observation instruments with which bombing airplanes are equipped enable the aviators to fix their targets by studying a series of angles. The instrument is set for a definite angle and the time is noted at which the target comes into view under that angle. The aviator then sets the instrument for another angle, which is less than the first, and again notes the time at which the target appears. He observes the number of seconds required for the machine to travel through these two angles and thereby arrives at the velocity of the machine over that distance.

The observation instrument is a simple frame, the sides of which form a quadrant. A pivot is attached to the under side of the frame which enables it to be set up on a vertical tube or other opening on the airplane. A clock is attached to the rear wall of the frame, while the front has another pivot which turns the telescope. The centre of the pivot is the centre of the angular arch from which the line of sight of the telescope is read.

Resemble Torpedoes in Shape.

The bombs dropped from airplanes resemble torpedoes in their shape and construction. Probably this is the reason why they are frequently miscalled aerial torpedoes. Many of them are equipped with a sort of windmill which is rotated by the rush of the bomb through the air and which sensitizes the percussion fuse while the bomb is falling.

They are built after the manner of a torpedo, with a streamline form to offer a very small head resistance to the wind. This streamline form, with the reduced head resistance, causes the bomb to sail through the air in the same direction as the airplane. This continues for a few seconds after it is released, and when it begins its descent. In order to be certain to hit their targets, the aviators of to-day to not content themselves with releasing one bomb, but instead, release a whole flock. If a number of bombs are dropped at once, the chances of hitting the target are far greater.

The Gotha airplane's bomb carrying capacity is said to be twelve fifty pound bombs and two 100 pound bombs. But formidable as that machine is, it is eclipsed by the English Handley-Page, which carries eight 250 pound bombs, totalling in weight 2,000 pounds, which is really two and a half times the capacity of the Gotha.

The powerful explosive used in these bombs is generally TNT. Any man of ordinary strength can easily carry enough of this powder to blow up one of our largest ships. It is said that eighty pounds of TNT could easily destroy any ship afloat. At the moment of explosion four cubic feet of TNT will generate 40,000 cubic feet of gas. This is the reason why depth bombs employing TNT are so dangerous to submarines.

For example, if a depth bomb is detonated near a ship or a submarine it will destroy the vessel because water is incompressible. The gases must escape somewhere. If the bomb is exploded at sufficient depth the shock is transmitted in all directions. Naturally, if a ship is near the gases will blow in the sides of the ship.

If, however, the bomb is exploded near the surface of the water, the gases will escape along the line of least resistance, which will be toward the surface. They will fling up great masses of water in the air. Bombs which are designed to explode at a given depth may be relied upon to destroy any ship which is in their vicinity. It is not necessary for a depth bomb to touch a submarine or a ship in order to destroy it.

New Depth Bomb Invented.

Joseph A. Steinmetz, president of the Aero Club of Pennsylvania, has invented a depth bomb which is particularly designed to be used against the U-boats. He has planned to use a number of high speed flying boats which can serve either as aircraft or as boats on the surface of the water. One of these boats would be used as a sort of scout to discover lurking submarines.

At the moment of discovery the seaplane would notify its sister craft. Some of these would endeavor to pass over the submarine while floating on the water in their capacity as boats. The seaplane on the water would trail a depth bomb. Its sister ship in the air would signal to it the movements of the submarine, thereby enabling it to follow the undersea craft. In order to keep the bomb from coming to the surface of the water while it was being towed an inclined plate would be secured to the cable to which the bomb was attached. The bomb itself is provided with contacts which would cause it to explode the moment it touched any object.

Holds 250 Pounds of TNT.

It is said that the average depth bomb contains from 250 to 350 pounds of TNT. When a destroyer sights a submarine it makes a dash for it at full speed. When it has come within a certain distance of the submarine it drops a depth bomb overboard. The bomb is so constructed that it will be detonated at any desired depth. As it is not necessary for the bomb to hit the submarine in order to destroy it the aim does not have to be as accurate as in the case of a bomb dropped by an air craft.

Some depth bombs are so constructed that they may be detonated by the pressure of the water. As everybody knows the pressure of the water increases with every foot one goes beneath the surface. In order to set a bomb of this type it is only necessary to determine at what depth it shall be exploded. Then a spring is adjusted and the bomb sinks until the water pressure releases the spring mechanism and causes the detonation. It is something like setting an alarm clock, only instead of setting the mechanism to go off at a certain time it is set to go off at a given number of feet beneath the surface of the water.

Another depth bomb is exploded by complicated clockwork, which is put in operation the moment the bomb strikes the water. As the clockwork is designed to run for several seconds before the bomb is exploded, the bomb is supposed to reach the desired depth before the detonation takes place. Because water is incompressible, a depth bomb will do far more damage if it is exploded 100 feet beneath the surface than it would if it were exploded only ten or fifteen feet below the surface.

Another type of underwater depth bomb is intended to be used from airplanes. It is dropped from the airplane on a cable. A parachute aids it to fall straight and keeps the cable from becoming entangled. The length of the cable determines the depth at which the bomb shall explode. The explosive in this bomb is carried in a long cylinder which has a detonator and an electric battery in one end.

Most Damage Done in Water.

Bombs which explode in the water are capable of doing far greater harm than those which explode on the land. It has been noted that the bombs dropped by the Germans in England frequently dig a hole in the ground five or six feet in depth, but fail to do any great amount of damage when they explode. While their radius of destruction is so limited, the force of the explosion will shatter window panes for a half mile around. Yet if a bomb of this same type should fall in the middle of a road which ran between stone walls it would not tear down the wall on either side of the road.

Perhaps if the bombs could be so made that they would explode above the surface of the ground the effect of the explosion would not be lost on the walls of the crater as it is now. With all their frightfulness the Germans have not been very successful in making bombs which do a great deal of harm. Casualties resulting from a bomb raid are frequently caused by shrapnel used against the enemy aircraft. That is one of the reasons why civilians are always ordered indoors and off the streets during a bomb raid. The anti-aircraft guns puffing away at the enemy are very dangerous to any persons who are in the open during the bombardment.

The Alert Newsdealer.

"AS with a bundle in each hand I approach the news stand where I buy my paper," said Mr. Gozzleby, "I think to myself that I will have to set down one of those bundles when I get there; but the alert newsdealer, seeing me coming, thinks differently.

"As I draw nearer, I see him reach for a copy of the paper I buy, give it a couple of quick, smooth flips to reduce its compass and then turn toward me, while I, divining his purpose, lift one arm slightly and under that the newsdealer swiftly and snugly tucks the paper.

"So after all I don't have to put either bundle down till I get to the ticket window in the subway."